

Science Booklet

Second term : 2023 /2024

PREPARED BY : MISS: SALWA AHMED

Student name:…………………………..

Class:

Unit one: periodic Motion

Lesson one: oscillatory motion

Periodic motion: it is a motion, which is regularly repeated in equal periods of time

EXAMPLES OF PERIODIC MOTION

Oscillatory motion | **wave motion**





Oscillatory motion:

It is the periodic motion of the oscillating body around its rest point, where the motion is repeated through equal intervals of time.

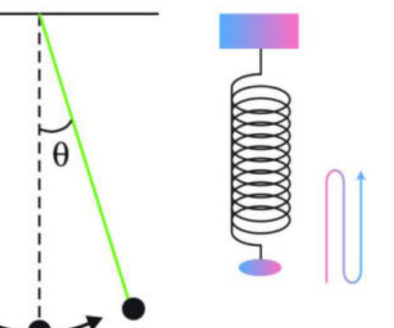
The relation between the velocity of an oscillating body and kinetic energy:

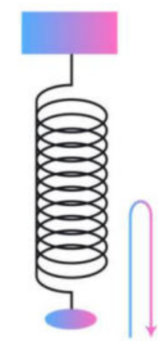
The kinetic energy = $\frac{1}{2}$(mass* squared velocity) = $\frac{1}{2}$*mv^2

The kinetic energy of an oscillating body is directly proportional to:

***the mass of the oscillatory body.** *** the squared velocity of the oscillating body**

- **The motion of the spring is regularly repeated in equal periods of time at the two sides of its rest position.**
- **the velocity of the oscillating body is very high when it passes its rest position.**
- **The velocity of the oscillating body decreases when it goes far from its rest position until it reaches zero at the maximum displacement.**





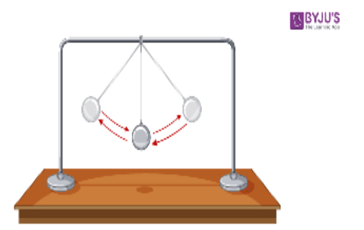
EXAMPLES OF THE OSCILLATORY MOTION:



Tuning fork



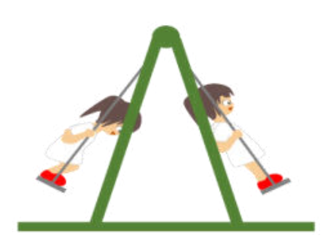
spring



Pendulum



Stretched string



Motion of swing

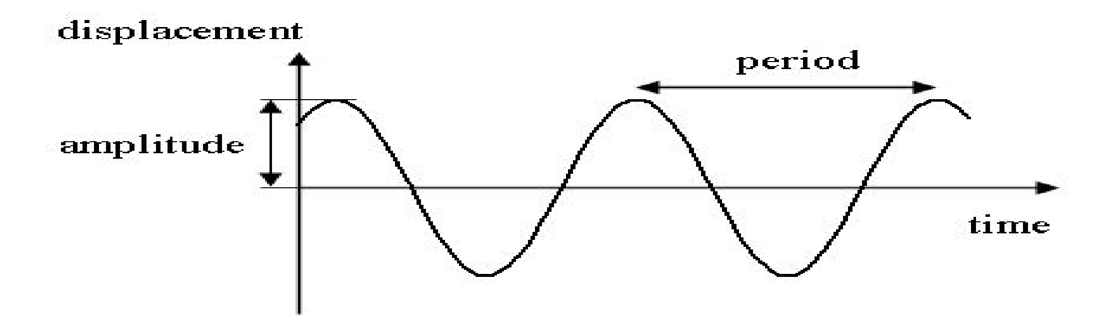
Give reason:

The motion of rotary bee is considered as a **periodic motion only** but it is not an **oscillatory motion.**

Bec. It is repeated regularly at equal time intervals, not repeated on the two sides of its rest position.

GRAPHICAL REPRESENTATION OF THE OSCILLATORY MOTION:

The motion of the wieght which is called the simple harmonic motion is concidered the simplest form of oscillatory motion.

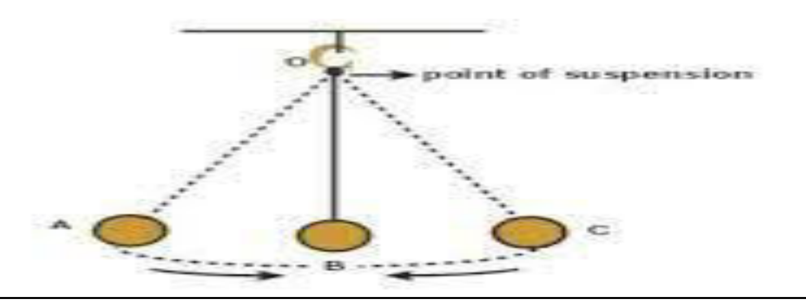


- **in the simple harmonic motion: the velocity** of the oscillating body **is inversely proportional to displacement** away from its rest position (A)

PROPERTIES OF OSCILLATORY MOTION:

1. **Amplitude:**

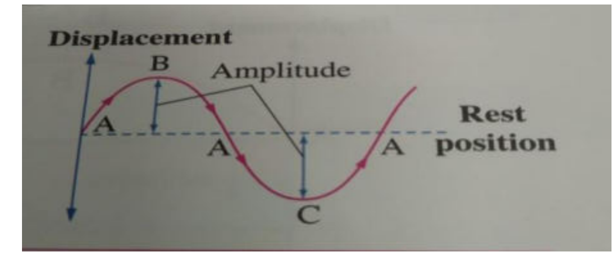




The maximum displacement that the pendulum makes when it oscillates

from its rest position(B)

- **On the left side at point (A): the displacement (BA) equals the displacement (AB)**
- **On the right side at point (C): the displacement (BC) equals the displacement (CB)**
- **The displacement (BA) = the displacement (BC)**
- **each of the following displacements(AB ,**



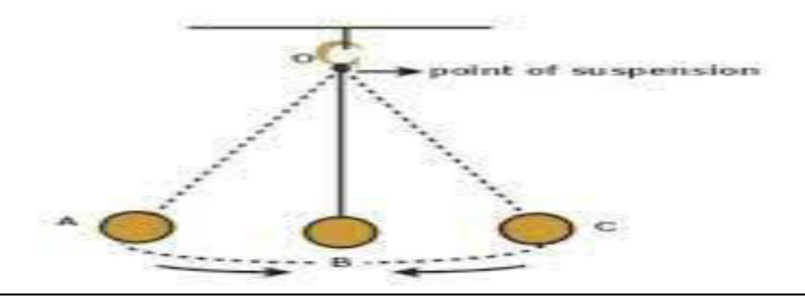
Amplitude:

It is the maximum displacement achieved by the oscillating body away from its rest position.

- **The measuring unit of the amplitude is metre(m)**

2. COMPLETE OSCILLATION.

It is the motion of an oscillating body when it passes by a fixed point on its path two successive times in the same direction.



When the pendulum moves back and forth:

- **From: B to A then from A to B**
- **Then from B to C then from C to B**

Amplitude = $\frac{1}{4}$ complete oscillation

Distance of one complete oscillation = 4 * amplitude

3) periodic time	4) frequency
Periodic time: It is the time taken by an oscillating body to make one complete oscillation. **Measuring unit:** Second (sec.) **Low used:** Periodic time = $\frac{time\ in\ seconds}{number\ of\ complete\ oscillations}$	**Frequency:** It is the number of complete oscillations produced by an oscillating body in one second. **Measuring unit:** Oscillation/sec. or Hertz **Low used:** Frequency = $\frac{number\ of\ complete\ oscillations}{time\ in\ seconds}$

THE RELATION BETWEEN PERIODIC TIME AND FREQUENCY OF AN OSCILLATING BODY:

periodic time (T)* Frequency (F)=

$$\frac{time\ in\ seconds}{number\ of\ complete\ oscillations} * \frac{number\ of\ complete\ oscillations}{time\ in\ seconds}$$

Periodic time * frequency = 1 **frequency**

Periodic time = $\frac{1}{frequency}$ frequency= $\frac{1}{periodic\ time}$

1. Frequency is inversely proportional to the periodic time.

For example:

Calculate the periodic time and the frequency of an oscillating body that makes 300 complete oscillation in half a minute.

Solution:

Time in seconds = 0.5 * 60 = 30sec.

Periodic time (T) = $\frac{time\ in\ seconds}{number\ of\ complete\ oscillations}$ = $\frac{30}{300}$ = 0.1sec.

Frequency (F) = $\frac{1}{T}$ = $\frac{1}{0.1}$ = 10HZ

Revision on lesson one

Complete the following:

1. **The maximum displacement achieved by the oscillating body away from its rest position is …………….**
2. **Kinetic energy = $\frac{1}{2}$ * …………..**
3. **The amplitude of the simple pendulum is ……………**
4. **The maximum displacement achieved by the oscillating body away from rest position is ……………..**
5. **The result of multiplying the frequency as an oscillating body by its periodic time equals ……………**

Write the scientific term of each of the following:

1. **The periodic motion made by a body around its point of rest, where the motion its repeated through equal intervals of time. (   )**
2. **The number of complete oscillations produced by the oscillating body in one second. (   )**

Give reason for:

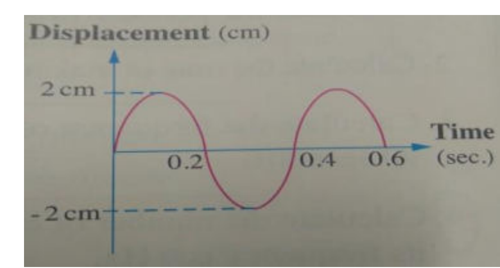
1. **The oscillatory motion is considered as a periodic motion.**

…………………………………………………………………………………………………
……………………………………………………………………………………………….

2. **The motion of rotary bee is a periodic motion only, but it is not an oscillatory motion.**

…………………………………………………………………………………………………
…………………………………………………………………………………………………

Problems:



1. **From the following figure , choose the correct answer:**

a) The periodic time = …………………..
(0.2 sec. , 0.4sec , 0.6 sec , 0.4)
b) Frequency = …………
(0.2 sec. ,0.4HZ , 2.5cycle \ sec , 0.4m)
c) The amplitude = …………….
(0.2 sec. , 0.4sec , 2cm , 0.4cm)

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2. **Calculate the number of complete oscillations that are made by a body in 2 minutes if its frequency is 6 HZ.**
3. **If the oscillating body makes 480 complete oscillations in one minute, calculate:**

a. Frequency **b. periodic time**

Lesson two
Wave motion

the wave:

it is the disturbance that propagates and transfers energy in the direction of propagation.

Wave motion:

It is the periodic motion produced as a result of the vibration of the medium particles at acertain moment and in a definite direction.

The line of wave propagation:

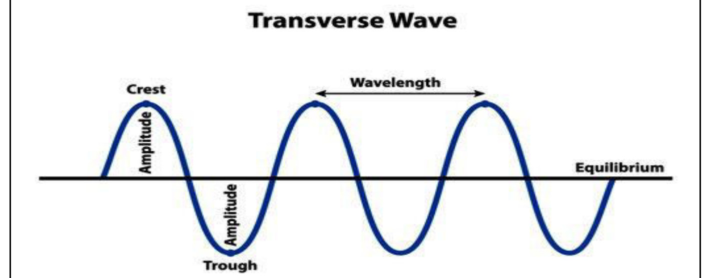
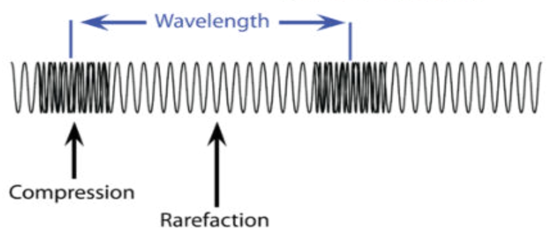
It is the direction of propagation of the wave

TYPES OF WAVES

Waves are classified according to:

1. **The direction of vibration of medium particles relative to the direction of wave propagation line.**
   - **Transverse waves** - **longitudinal waves**
2. **The ability of the wave to propagate and transfer energy into:**
   - **Electromagnetic waves** - **Mechanical waves**

(1)

Transverse waves	longitudinal waves
transverse waves: **It is a disturbance in which the particles of the medium vibrate perpendicular to the direction of wave propagation**  **Crest:** **It is the highest point of the particles of the medium in the transverse wave** **Trough:** **it is the lowest point of the particles of the medium in the transverse wave**	**. longitudinal waves:** **It is a disturbance in which the particles of the medium vibrate along the direction of wave propagation**  **Compression:** **It is the area in the longitudinal wave at which the medium particles are the highest density and pressure** **Rarefaction:** **It is the area in the longitudinal wave at which the medium particles are of the lowest density and pressure**

Real life

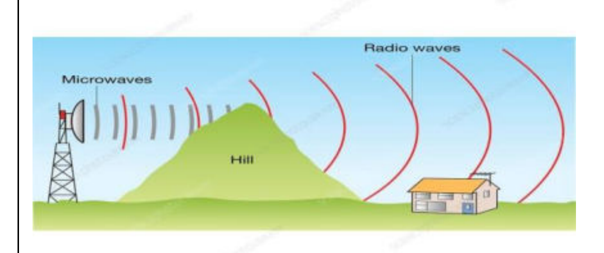
Physiotherapy tubs (Jacuzzi): it is a tub where Water moves in the form of circular waves and it is found in most health clubs.

Uses:

Used to treat sprains and cramps by using hot water.
Used to treat Nervous tension by using cold water.

(2)

<table>
<tr><th>Electromagnetic waves</th><th>Mechanical waves</th></tr>
<tr><td>

<u>Electromagnetic waves:</u>
They are waves which do not need a medium to propagate, where they propagate through vacuum.
<u>Types:</u>
They are all transverse waves, such as:
• **Visible light waves**
• **Infrared waves**
• **Radio waves**


<u>Velocity of propagation:</u>
They are propagate by a velocity = $3*10^{8}$m/sec. in vacuum but their velocity decreases when they transfer in media.

</td><td>

<u>Mechanical waves:</u>
They are waves which need a medium to propagate, where they do not propagate through vacuum.
<u>Types:</u>
they may be:
transverse waves :as water waves

longitudinal waves: as sound waves

<u>Velocity of propagation:</u>
They with a velocity is much less than the velocity of electromagnetic waves in media.

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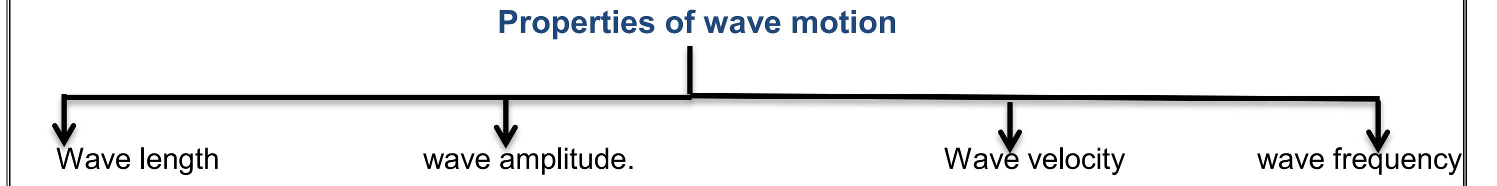
Give reason for:

Radio waves are transverse electromagnetic waves.

They are transverse: because the particles of the medium vibrate perpendicular to the direction of wave propagation

Electromagnetic: because they propagate through vacuum.

Properties of wave motion



Wave length:

The wave length of transverse wave:

It is the distance between two successive crests or troughs.

The wave length of the longitudinal wave:

It is the distance between the centres of two successive compressions or rarefaction.

The measuring unit of wavelength (λ) is "**metre**"

Laws used for determination the wavelength:

Wave length of transverse wave = 2 * the horizontal distance between the successive crest and trough.

Wavelength of longitudinal wave = 2 * the distance between the centres of successive compression and rarefaction.

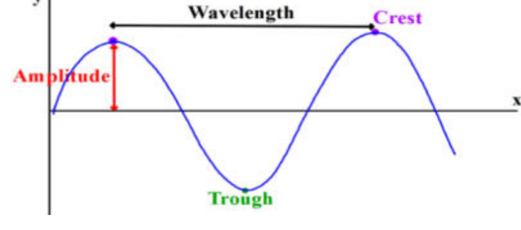
Wavelength of a longitudinal wave = $\frac{\text{the distance covered by waves}}{\text{number of waves}}$

Fraction of metre:

	Unit	Standard form for metres	
	Metre (m)	1	÷1000
X1000	Millimetre (mm)	x 10^{-3} m	÷1000
X1000	Micrometre (µm)	x 10^{-6} m	÷1000
X1000	Nanometre (nm)	x 10^{-9} m	÷1000
X1000	Picometre (pm)	x 10^{-12} m	

2) Wave amplitude:

It is the maximum displacement achieved by the medium particles away from their rest positions.



Wave amplitude= $\frac{\textit{the vertical distance between the crest and trough of wave}}{2}$

3) wave velocity (V):

It is the distance covered by the wave in one second.

Wave velocity (V) = $\frac{\text{distance covered by wave in metres (m)}}{\text{time in seconds}(s)}$

- The velocity of sound waves through air = 340m/s
- The velocity of sound waves through water = 1500m/s
- The velocity of sound waves through wood = 1850m/s

4) wave frequency:

it is the number of complete waves produced from the source in one second.

The measuring unit frequency is "Hertz"

Periodic time of the wave: it is the time to make one wave.

The measuring unit of periodic time is "second"

Wave frequency= $\frac{\textbf{number of complete waves}}{\textbf{time in seconds } (s)}$

Periodic time of wave (T) = $\frac{\textbf{1}}{\textbf{frequency (F)}}$

Law of wave propagation:

Wave velocity (V)	=	Frequency (F)	*	Wavelength (ƛ)

For Example:

A longitudinal wave is produced by a spiral spring where the distance between the first and the fourth rarefactions of such wave is 20 Hertz.

Find the wave velocity if the frequency of such wave is 20 Hertz.

Solution

3 waves are formed between the first and fourth rarefactions.

Wavelength (ƛ) = $\frac{\textit{Distance covered by waves}}{\textit{number of waves}} = \frac{18}{3}$ **= 6cm = 0.06m**

Wave velocity(V) = frequency(F) * wavelength(ƛ)= 20*0.06= 1.2 m/s.

Revision on lesson two

Complete the following statements:

1. waves are classified according to the ability to propagate and transfer energy into …………… and ……………..
2. radio waves are considered as …………… waves that propagate through free space with a velocity of…………….
3. The crest in the……………. Wave is equivalent to the………….. in the longitudinal wave.
4. Jacuzzi is used to treat………….. and cramps by using hot water and……………. By using cold water.
5. The longitudinal wave consists of ……….. and………………

Write the scientific term:

1. A distrurbance that propagate and transfers energy along the direction of propagation. (   )
2. The highest point of the particles of the medium in the transverse wave. (   )
3. The area in longitudinal wave at which the medium particles are are of the highest density and pressure. (   )
4. The relationship between wave velocity, frequency and the wavelength in the wave motion. (   )

Give reason for:

1. The waves produced due to vibration of a string are transverse mechanical waves.

………

2. We see lightning before hearing thunder.

………

Problems:

Sound waves of frequency 200Hertz and wavelength in air 1.7metre. Calculate:

a. the velocity of sound waves propagation in air.

b. the wavelength of these waves when they propagate in water with velocity 1500m/s.

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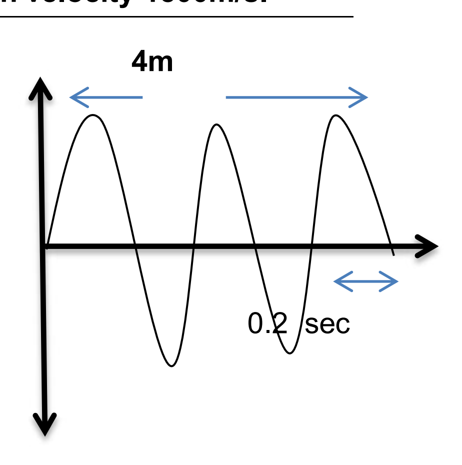
from the opposite figure, find:

1) wave length

2) Frequency

3) Amplitude

4) wave velocity.



Revision on unit one

1) choose the correct answer:

1. if the periodic time of a tuning fork is 4sec., so the frequency is………………..

a. 4Hz b. 6Hz c. $\frac{1}{4}$Hz d. $\frac{1}{6}$Hz

2. the sound waves are ……………. Waves.

a. mechanical longitudinal b. mechanical transverse

c. electromagnetic longitudinal d. electromagnetic transverse.

3. The wave transfers……………… in the direction of propagation.

a. molecules b. energy c. matter d. force

4. The double of the horizontal distance between a crest and a trough of a transverse wave is known as the ……………..

a. frequency b. wavelength c. amplitude d. wave velocity

2) write the scientific term:

1. The measuring unit of wave velocity. (   )
2. Physiotherapy tubs which are used to treat sprains , cramps and nervous tention. (   )
3. Maximum displacement made by the oscillating body away from in rest position. (   )
4. It is the motion produced as a result of the vibration of the particles of the medium in a certain moment and in a definite direction. (   )

3) Complete the following:

1. Light is ………………… waves but sound Is ………….. waves.
2. The crest in the ……………… wave is equivalent to the …………… in the longitudinal wave.
3. The complete oscillation includes …………… displacements, each is called……………
4. Waves are classified according to the ability to propagate and transfer energy into……….. and ………….. waves.

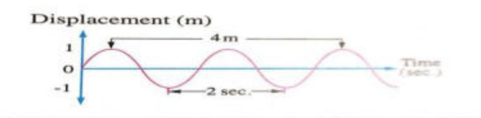
4) From the opposite figure, find:

1) Amplitude.

2) Periodic time.

3) Frequency.

4) Wavelength.



Unit two: sound and light

Lesson one: properties of sound waves

Sound:

It is an external factor that affects the ear causing the sense of hearing

- Sound waves are mechanical longitudinal waves.

Mechanical waves, because: they need a medium to propagate through.

Longitudinal waves, because: the medium particles vibrate in the same direction of wave propagation forming compressions and rarefactions.

Sound velocity:

- Sound travel through air a velocity 340m/sec.

Sound wave velocity (v) = Frequency (F) * Wave length (ƛ)

For example:

Sound waves are produced from a vibrating tuning fork of frequency 512 cycles/sec. if the wavelength of these waves is 60cm , calculate its velocity through air.

Solution:

Sound wave velocity (V) = wave frequency (F) * wavelength (ƛ)

$$512 * \frac{60}{100} = 307.2\text{m/sec.}$$

Audible sounds:

Musical tones	Noises
❖ They are tones of uniform frequency and comfortable to be heard. ❖ Violin , piano and reed pipe.	❖ They are sounds of non – uniform frequency and uncomfortable to be heard. ❖ Drill, loudspeakers and horns of cars.

Properties of sound waves:

1. Sound pitch
2. Sound intensity
3. Sound quality(type)

1) Sound pitch:

It is the property by which the ears can distinguish (differentiate) between harsh and sharp voices.

❖ **Sound is described as high pitched sound or low pitched sound.**

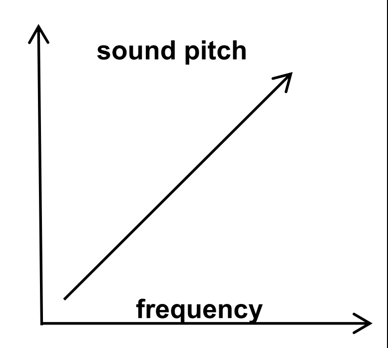
High pitched sound is sharp	Low pitched sound
❖ The voice of woman high pitched as it sharp.	❖ The voice of man is low pitched as it is hard.

- the voice of the lion is harsher than that of sparrow.

The relation between the sound pitch with sound frequency:

The sound pitch depends on the frequency of the sound source.

The sound pitch increases by increases the frequency and vice versa.



producing sound from vibration of air column:

in case of vibration of air column, the sound pitch depends on the length of the vibrating air column.

As the length of the vibrating air column increase, the sound frequency decrease so the harshness of sound increase.	As the length of the vibrating air column decrease, the sound frequency increase so the sharpness of sound increase
	

Frequency increases by decreases the length of air column and vice versa

Dete

1. listen to the tone you want to determine its pitch till your ears get to it.
2. Rotate savart's wheel at the time one if the gears teeth contacts a flexible metallic sheet
3. Increase the speed of rotation till you hear a sound to that of the unknown tone
4. Calculate the number of cycles taking place in a specific duration and by knowing the number of gear teeth you can determine the frequency of the tone as follows:

Sound frequency (F) = $\frac{\text{Number of cycles (turns)}(d) * number\ of\ geer\ teeth\ (n)}{time\ in\ seconds}$

For example:

Calculate the frequency of a musical tone similar to the frequency of a produced tone using savart's wheel rotated with a velocity of 960cycles in two minutes, given that the number of teeth of the gear is 30 teeth.

Solution:

time (t) = 2 * 60 =120seconds.

Frequency (F) = $\frac{\text{No.of cycles} * \text{No.of gear teeth}}{\text{time in sec.}} = \frac{960*30}{120}$ **= 240Hz**

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2) sound intensity:

Sound intensity:

It is the property by which the ears can distinguish between strong or weak sounds.

The measuring unit of sounds intensity is watt/m^2

- **Whispering is described as a weak sound** - **shouting is describing as a strong sound**

So that, the intensity of sound at a certain point is measured by the quantity of sound energy falling perpendicularly in one second on a unit area at that point.

- **The measuring unit of the level of sound intensity (noise intensity) is decibel.**

Factors affecting the sound intensity

1. The distance between the ear and the sound source.
2. The amplitude of vibration of the sound source.
3. The area of vibrating surface.
4. The medium density through which the sound travels.
5. The wind direction.

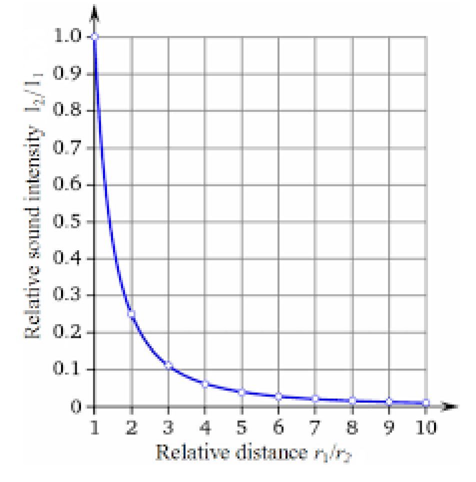
1. **The distance between the ear and the sound source:**

The intensity of sound is inversely proportional to the square of the distance (d^2) between that point and the source this known as: "The inverse square law of sound"

The inverse square law of sound:

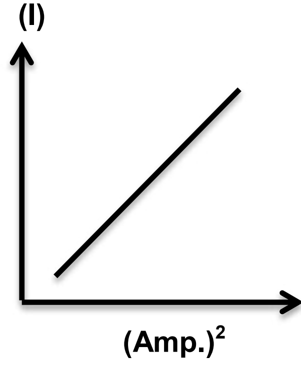
The intensity of sound at a point is inversely proportional to the distance between that point and the sound source.

Sound intensity = $\frac{\mathbf{1}}{\textbf{square of the distance}}$



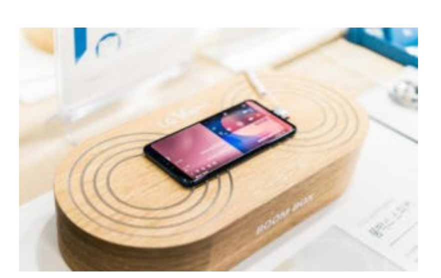
2. The amplitude of vibration of the sound source:

The sound intensity is directly proportional to the square of the amplitude of the sound source.



3. the area of the vibrating surface:

sound intensity increases by increasing the vibrating surface area when the source of sound touches a resonance body.



4. The medium density:

- Sound intensity decrease by decreasing the density of the medium and vice versa.
- Sound intensity is directly proportional to the medium in which sound travels.

5. **The wind direction:**

The intensity of sound increase when the direction of sound waves propagation is in the same direction of wind.	The intensity of sound decreases when the direction of sound waves propagation is in opposite direction of wind.

3) sound quality (type):

Sound quality:

It is the property by which the human ear can distinguish between different sounds according to the nature of the source even if they are equal intensity and pitch.

The complex tones: are composed of a fundamental tone associated by other tones higher in pitched and lower in intensity known as "harmonic tones".

For example: the tone produced from a violin or a piano.



The fundamental tone: the tone produced from a vibrating tuning fork which is the pure simple tone.



Harmonic tones:

They are tones that accompany the fundamental tone but they are higher pitch and lower in intensity, and differ from one instrument to another.

Sound waves

Infrasonic waves	Sonic waves	Ultrasonic waves
they are sound waves of frequencies lower than 20Hz such as the waves accompany the blowing of storms that precede rainfall and the human ear cannot hear them	They are sound waves of frequencies ranging from 20Hz to 20KHz Such as The waves that human ear can distinguish between them and can hear them	They are sound waves of frequencies higher than 20KHz Such as Some animals such as bats, dogs and dolphins can hear ultrasonic waves and the human ear cannot hear them

- **Dogs can hear all sounds produced by man (G.R.)**

Because, the range of sounds produced by man lies within the range of sounds heard by dogs.

- **Man can't hear sounds produced by a dolphin (G.R.)**

Because a dolphin produced ultrasonic waves, while the human ears can't hear sounds of frequencies more than 20 Kilohertz.

Ultrasonic waves are used in several medical, industrial and military fields such as:

Medical	1. Breaking down kidney and stones without any ureter stones without any surgical interventions 2. Diagnosis of male prostate gland tumors and its effect on bladder. 3. Discovering malignant tumors.
Industrial	Sterilization of food, water and milk as ultrasonic waves are characterized by their high ability to kill some types of bacteria and stop the action of some viruses.
Military	The discovery of landmines..

Revision on lesson one

1. **Choose the correct answer:**

1. **A sound travels in air with velocity 330metre/sec. and has a wavelength 0.1metre, its frequency equals……………**

a. 330Kilohartz   b. 3300Hertz   c.33Kilohertz   d.330hertz

2. **Sound of frequency 200Hz is ………….. than the sound of frequency 100Hz.**

a. stronger   b. sharper   c. weaker   d. harsher

3. **All of the following are factors affecting sound intensity, except the ……………**

a. amplitude of vibration   b. medium density

c. frequency   d. wind direction.

4. **The human ear can distinguish sounds of frequency……………**

a. 50KHz   b. 30KHz   c.300Hz   d.5 Hz.

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2) **Give Reason for:**

1. **Sound travelling in air has less intensity than that travelling in carbon dioxide.**

……
………………………………………………………………………………………………………

2. **The intensity of sound decrease as the amplitude of vibrating source decrease.**

……
……………………………………………………………………………………………………..

3. **We hear sound from all direction that surround the sound source.**

……
………………………………………………………………………………………………………

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3) Write the scientific term:

1. **The measuring unit of sound intensity.** (   )
2. **The intensity of sound at a point varies inversely with the square of the distance between that point and sound source.** (   )

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4) Savart's wheel rotates with a rate of 300 cycles per minute. A sound of frequency 600Hz is peoduced when an elastic plate touches the teeth of one gear. Calculate the number of teeth of the gear.

Lesson two: Wave nature of light

Light:

It is an external factor that affects the eye causing the sense of vision.

Nature of light waves:

Light waves are electromagnetic transverse waves (G.R.)

They are electromagnetic waves, bec. they propagate through vacuum

They are transverse waves, Bec. the medium particles vibrate perpendicular to the direction of the wave propagation forming crests and troughs.

- ***The speed of light waves through vacuum = $3*10^8$ m/sec***

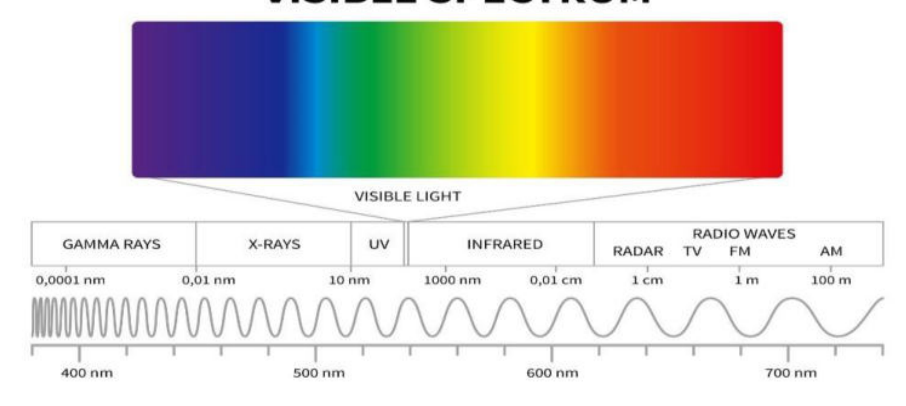
The speed of light:

it is the distance covered by light in one second.

Speed of light = $\frac{\text{distance (m)}}{\text{time (sec.)}}$

The visible light:

It is one of the components of electromagnetic spectrum of wavelength ranges between 380:700 nanometre.



Analysis of white light:

Analysis of white light:

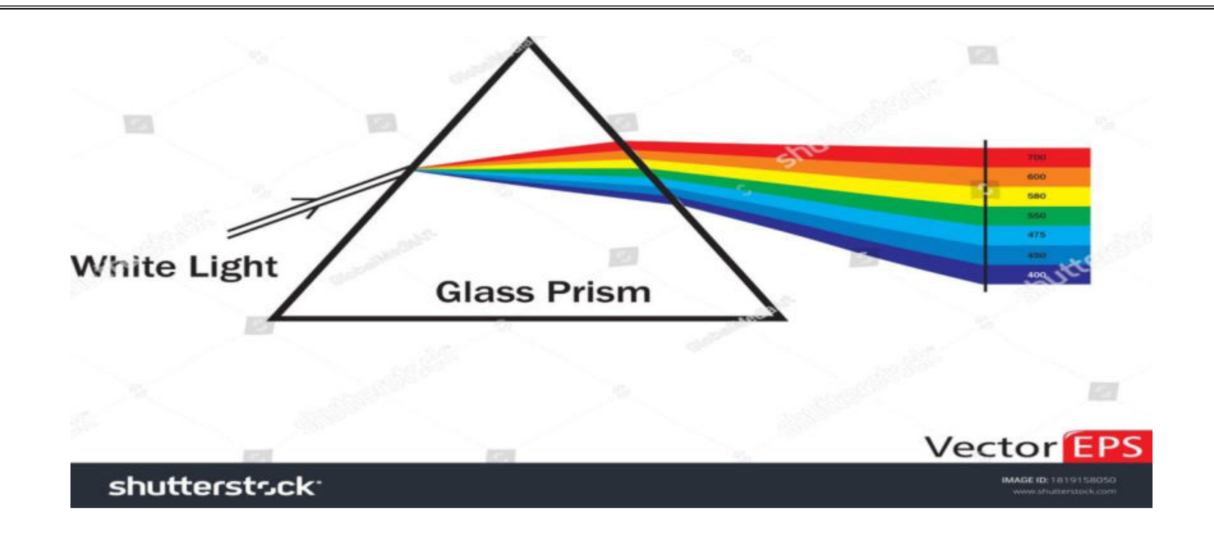
It is the splitting of white light into seven colours called spectrum colours.

- White light consists of mixture of seven colors which are known as "spectrum colors"

These colors are Red , orange , yellow , Green , Blue , indigo , Violet.

When the white light falls on a triangular glass prism , it is analysed into seven spectrum colours which are constant in speed and different in:

- **Wavelength** **- frequency** **-Angle of deviation**



The lowest deviation (is the closest to the prism apex) → Red, Which is the lowest frequency (longest wavelength)

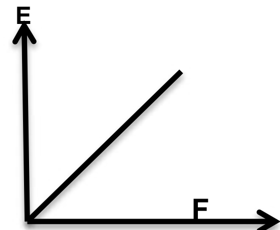
The highest deviation (the closest to the prism base) → Violet which is the Highest frequency (shortest wavelength)

Energy of light waves:

The German scientist max plank proved that:

- The energy of light waves is composed of energy quanta Known as "photons"
- The energy of the photons (E) is directly proportional to the frequency of the light wave (F)

Photon energy= plank's constant * photon frequency



Light is used in home decoration like:

Spot lights → used to illuminate aircrafts

Ornamented lamps → that bring happiness and joy to the place

Stand lamps → that concentrate light for reading

Light behavior through different media:

Media can be classified to their ability to allow light to pass through; into:

Transparent medium	Translucent (semi-transparent) medium	Opaque medium
Transparent medium: **It is the medium, which permits most light to pass through** **Objects can be seen very clearly through medium.** **Examples:** the clear glass Air Pure water	**Translucent medium:** **It is the medium, which permits only a part of light to pass through and absorbs the remaining part.** **Objects can be seen through transparent medium less clearly than the transparent one.** **Examples:** **Frosted glass** **Tissue paper**	**Opaque medium:** **It is the medium, which doesn't permit light to pass through** **Objects can't be seen through opaque medium.** **Examples** **Plant leaves** **Books** **Milk** **Carton** **Black honey** **Wood** **Metals** **Human skin** **Foil paper**

Light travels in straight lines:

Light travels through transparent media in the form of straight lines whose size can be controlled

- **The quantity of light falling perpendicular to a unit area of a surface in one second is called "light intensity"**

Light intensity:

It is the quantity of light falling perpendicular to a unit area of a surface in one second.

Light intensity of a surface decrease as the distance between the surface and the light source increase according to "the inverse square law"

The inverse square law:

The light intensity of a surface is inversely proportional to the square of the distance between the surface and the source of light

Light intensity $\propto \frac{1}{d2}$

Revision on lesson two

1)choose the correct answer:

1. Light waves are …………. Waves.

a. mechanical transverse
b. electromagnetic transverse
c. electromagnetic longitudinal
d. mechanical longitudinal

2. Photon energy = plank's constant * ………………..

a. Photon frequency
b. photon wavelength
c. amplitude.
d. photon velocity.

3. The human skin is considered as a/an …………… medium.

a. transparent
b. opaque
c. transverse
d. semi-transparent

4. Light travels in …………… lines.

a. curved
b. circular
c. straight
d. zigzag

5. When the distance between the source of light and the surface of a wall decreases, the light intensity on the surface…………..

a. decrease
b. increase
c. is doubled
d. remains constant

---

2)Write the scientific term of each of following

1. The main source of light energy on the Earth's surface. (   )
2. A mixture of seven spectrum colours. (   )
3. The colour which has the highest frequency, shortest wavelength (   )
4. A medium doesn't allow light rays to penetrate through. (   )

Give reason for:

1. The energy of red light photon is less than that of orange light photon.

………

2. A clear glass is a transparent medium.

……………………………………………………………………………………………………….

3. A tissue paper is a transparent medium.

………..

4. The in ability to see the impurities present in black honey

………

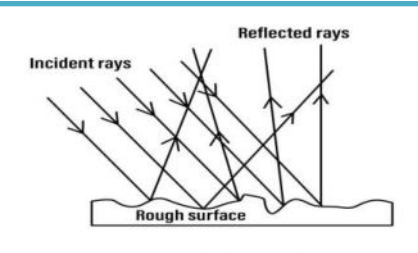
Lesson three: Reflection and Refraction of light

1. Light Reflection:

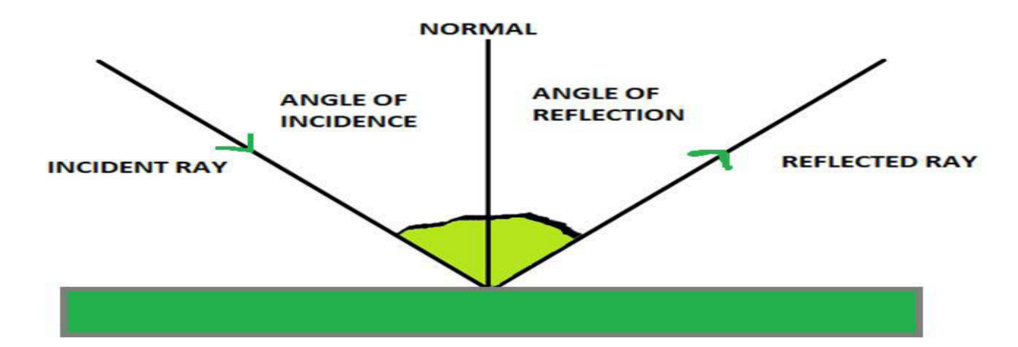
Light Reflection:

It is the rebounding (Returning back) of light waves in the same medium on meeting a reflecting surface.

Types of light reflection:

Regular (uniform) reflection	Irregular (non- uniform) reflection
Regular reflection: **It is the reflection of light rays when they meet (fall on) a smooth (uniform), where the incident light rays are reflected in one direction.**  **Examples:(of smooth surfaces):** **A plane mirror.** **A thin sheet of aluminium (foil).** **A stainless steel sheet.**	**irregular reflection:** **It is the reflection of light rays when they meet (fall on) a rough (non-uniform) and where the incident light rays are reflected in different (many) directions.**  **Examples:(of rough surfaces):** **A leaf of a tree.** **A piece of paper.** **A piece of leather.** **A piece of wool.**

Laws of light reflection:

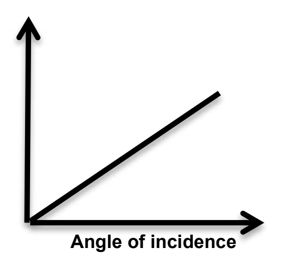


1. **The incident light ray: it is the light beam which is represented by a straight line, it intersects with the reflecting surface at the point of incidence.**

2. **The reflected light ray: it is a narrow light beam which is represented by a straight line, it is reflected from the reflecting surface at the point of incidence.**
3. **Angle of incidence: it is the angle between the incident light ray and the line perpendicular to the reflecting surface at the point of incidence.**
4. **Angle of reflection: it is the angle between the reflected light ray and the line perpendicular to the reflecting surface at the point of incidence.**

The reflection of light is governed by two laws:

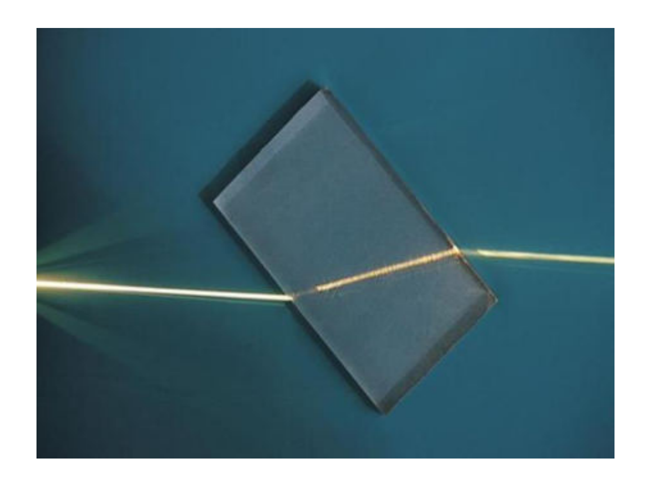
First law: Angle of incidence = Angle of reflection.



Second law: the incident light ray, the reflected light ray and the normal to the surface of reflection at the point of incidence, all locate in one plane perpendicular to the surface.

Light refraction:

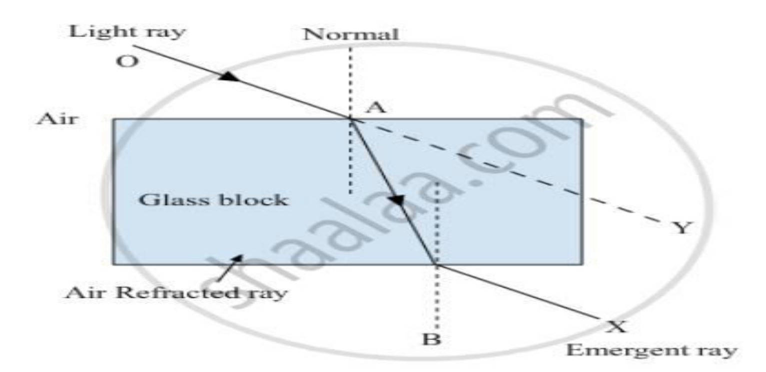
It is the change of light path when it travels from a transparent medium to another transparent medium to another transparent medium of different optical density.



Optical density of the medium:

It is the ability of the transparent medium to refract light.

Concepts related to light refraction:



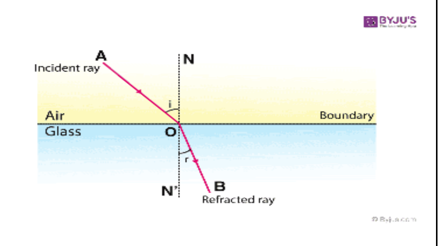
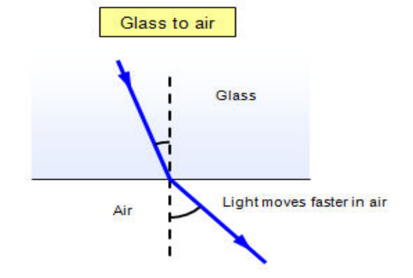
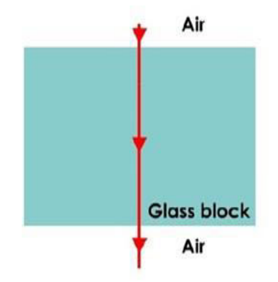
Angle of incidence: it is the angle between the incident light ray and the normal at the point of incidence on the interface.

Angle of refraction: it is the angle between the refracted light ray and the normal at the pont of incidence on the interface

Angle of emergence: it is the angle between the emergent light ray and the normal at the point of emergence on the interface.

Laws of light refraction:

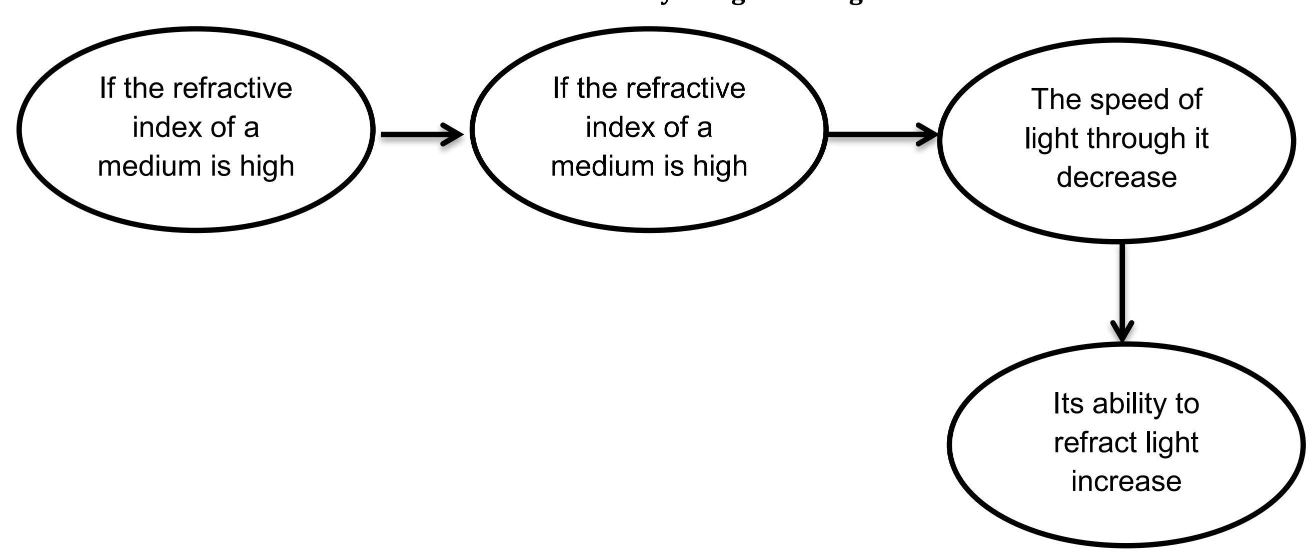
The path of a light falls on the interface between two transparent media differ in their optical densities.

When a light ray travels from a transparent medium of **lower optical density** (like air or water) to another of **higher optical density** (like glass)	When a light ray travels from a transparent medium of **higher optical density** (like glass) to another of **lower optical density** (like air)	When a light falls perpendicular to the interface between two different transparent media.
The light ray refracts near the normal  The angle of incidence is **greater than** the angle of refraction	The light ray refracts far from the normal  The angle of incidence is **smaller than** the angle of refraction.	The light ray passes without rarefaction.  The angle of incidence is equal to the angle of refraction equals zero.

Absolute refractive index of a medium:

It is the ratio between the velocity of light through air to the velocity of light through another transparent medium.

Absolute refractive index of a medium= $\frac{\text{velocity of light through air}}{\text{velocity of light through the medium}}$



For Example:

If the velocity of light through water is 2025×10^{8}m/s, calculate the absolute refractive index of water. Knowing that the velocity of light through air is 3×10^{8}m/s.

Solution:

The absolute refractive index of water = $\frac{\text{velocity of light through air}}{velocity\ of\ light\ through\ water} = \frac{3\times10^8}{2.25\times10^8}$=1.33

Apparent shapes of objects:



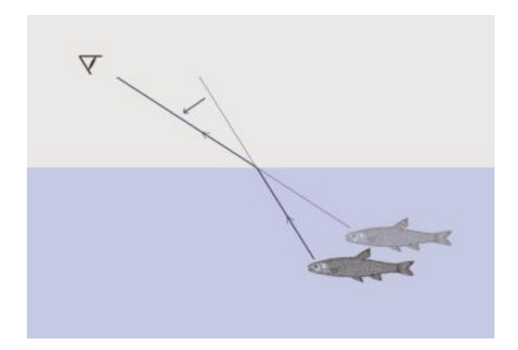
A pencil, which is partially immersed in water, appears as being broken.

Due to the refraction of light rays coming from the immersed part in water.

Apparent positions of objects:

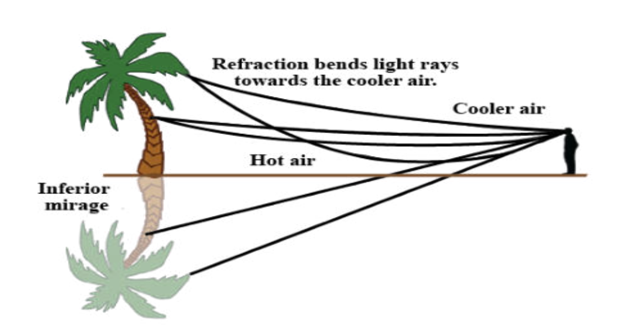
The submerged object in water is seen in an apparent position slightly above its real

Position



Mirage:

It is a natural phenomenon that takes place on the desert roads at noon especially in the summer times, where objects on the road sides seem as if they have inverted images on a wet area.



Revision on lesson three

Write the scientific term:

1. The reflection in which the light rays recoil in many directions when falling on a rough surface. (   )
2. The angle between the reflected light ray and the normal at the point of incidence on the separating surface. (   )
3. The ability of the medium to refract light rays. (   )
4. Changing the path of light when it travels from a transparent medium to another transparent medium of different optical density. (   )
5. The ratio between the velocities of light through air to the velocity of light through transparent medium. (   )

Complete the following:

1. when a light ray travels from a transparent medium of higher optical density to another of lower density, the angle of………………… is more than the angle of ………………….
2. Light …………… is the change of light path when it travels from a transparent medium to another one of different……………..

Give reason for:

1. The light that falls perpendicular on a glistening surface reflects on itself.

……………………………………………………………………………………………………….

2. When the light ray travels from air to water it refracts near to the normal.

……………………………………………………………………………………………………..

3. Occurrence of mirage phenomenon in desert regions at noon.

……………………………………………………………………………………………………….

What happen if..?

1. Alight ray falls perpendicular to the interface between two transparent media of different optical densities.

………

Problems:

1. if the angle between the incident light ray and the reflected light ray is 140^{o}, find the angle of incidence and the angle of reflection.

……

2. calculate the absolute refractive index of diamond given that the speed of light through it is 1.25×10^{8}m/s.(knowing that the velocity of light through air is 3×10^{8}m/s

Revision on unit two

1) write the scientific term:

1. Sound waves of frequencies less than 20Hz. (   )
2. A medium does not allow light rays to penetrate throw. (   )
3. Changing the path of light when travel from a transparent medium to another transparent medium of different optical density. (   )

2) choose the correct answer:

1. Sound of frequency 200Hz is ………….. than sound of frequency 100Hz.

a. sharper b. stronger c. harsher d. weaker

2. When the distance between the source of light and the surface as a wall decreases , the light intensity on the surface…………….

a. decrease b. increase c. doubled d. remains constant

3) write down the mathematical relation that joins between each of the following:

1. The photon frequency and its energy.

…….

2. The sound frequency (F), the number of teeth of each of the gear in savart's wheel (n).

……..

4) what are the results due to each of the following…?

1. Incidence of light rays on a rough surface.

………

2. Incidence of a white light ray on one face of a triangular glass prism.

………

5) complete the path of rays in each of the following figures according to what is written below each:

A)

Mirror X
40°
Mirror Y

Determination of the angle of reflection of the ray on mirror (Y)

B)

50°
Air
Transparent plastic
X

calculate the angle of emergence from point (X)

Unit three: Reproduction and continuity of species

Lesson one: Reproduction in plants

Reproduction process:

It is a vital process that aims to secure the existence and continuity of living organisms species by producing new individuals of the same species to prevent them from.

Reproduction in plants:

1. **Sexual reproduction**
2. **Asexual Reproduction**

First: Sexual Reproduction in plants:

Flower:

It is a short stem whose leaves are modified to form genital organs which in turn form inside fruits.

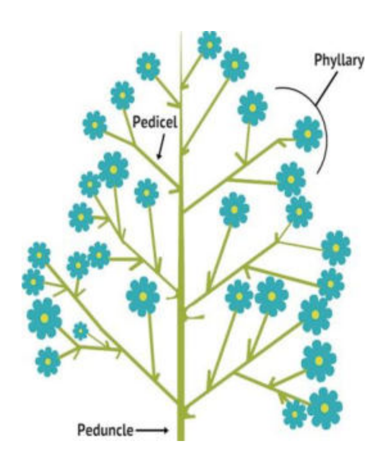
Origin of the flower:

Bract:

It is the green leaf, where the floral bud emerges from its axle and developed into a flower.

Inflorescence:

It is a group of flowers carried on the same axle.

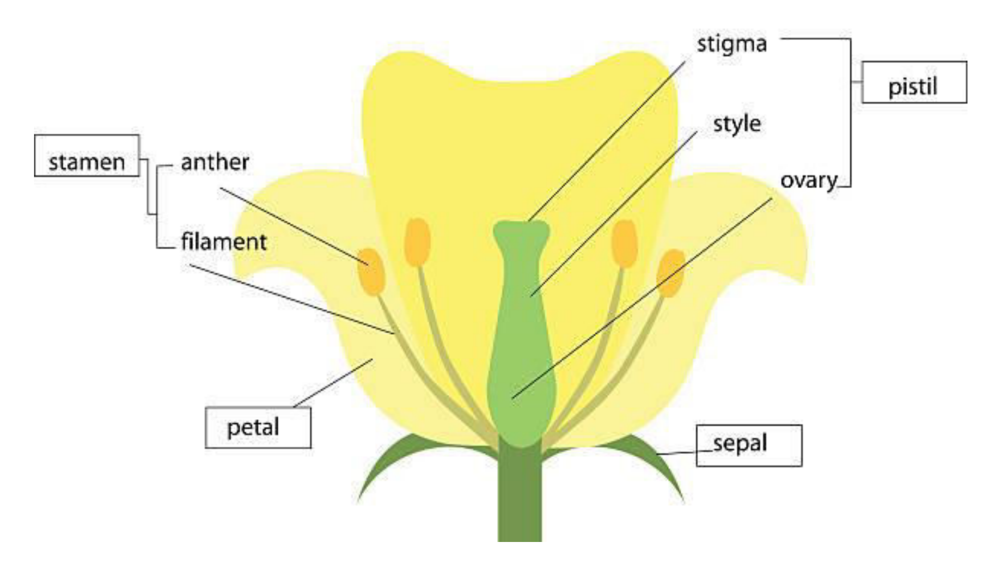


The structure of the flower:

Receptacle:

It is the swollen part upon the flower pedicle, on which the floral leaves are existed.

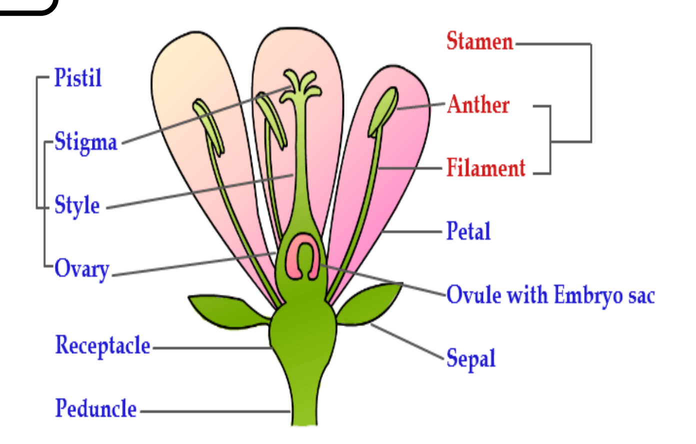
The Structure of a Flower



Whorl	Calyx	corolla	Androecium	Gynoecium
Consists of and Description :	It consists of a group of green leaves each leaf is called a "sepal" Calyx	It consists of a group of bright colored scented leaves, each leaf is called a "petal"	It is the **male** reproductive organ of the flower Its leaves are known as "**filament** "ends in a sac known as the **anther**, which is divided into two parts, each part has two chambers containing pollen grains.	It is the **female** reproductive organ of the flower. Its leaves are Known as "carpels" which resemble the flask in shape. Each carpel consists of a swollen part called the **ovary**, which is connected with a tube called the **style**, which ends in an opening called the **stigma**. Stigma Style Ovary Figure 4.32: Pistil
Function:	it protects the inner parts of the flower specially before blooming	It protects the reproductive organs It attracts insects to the flower, which help in reproduction.	It produces pollen grains	It produces ovules

Typical flower:

It is the flower that contains four floral whole.



The sex of flower:

Bisexual flower:

Flower that both male and female reproductive organs

Unisexual flower:

Flower that carries either male or female reproductive organ only.

Flower	Hermaphrodite flower	Male flower	Female flower
Reproductive organs	Bisexual and carpel	unisexual	unisexual
Reproductive organs	Stamen and carpel	Stamen only	Carpel only
Number of floral whorls	4	3	3
Examples	Flowers of most plants such as: Flax Tulip Petunia Wallflower Peas Sunflower.	Flowers of some plants such as: Palms Maize Pumpkins	

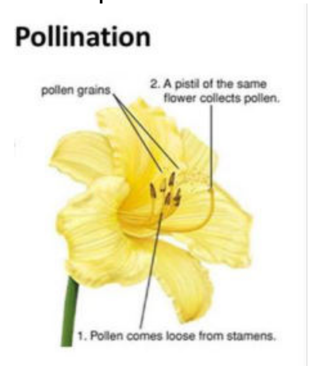
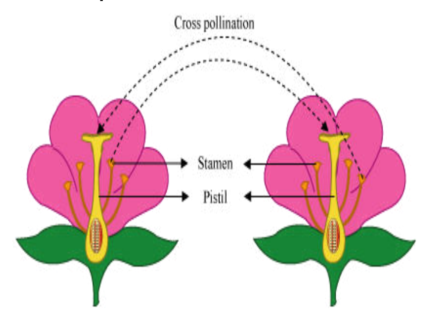
Steps of sexual reproduction in plants:

1. Pollination **2. Fertilization.**

Pollination:

It is the process of transfer of pollen grains from the anthers of a flower to the stigmas.

Types of pollination:

Self pollination	Mixed pollination
Self pollination: It is the transfer of pollen grains from the anthers of a flower to the stigmas of another flower in the same plant.  **Reasons of occurrence:** Flowers must be bisexual and characterized by one of the following: Anthers and stigma are maturated in the same time, such as **flax plant.** Non-blooming flowers until completion of fertilization process, such as **barley plant.**	**Mixed pollination:** It is the transfer of pollen grains from the anthers of a flower to the stigmas of another flower in other plant of the same kind.  **Reasons of occurrence:** The flower is bisexual and its anthers and stigmas are not matured at the same time, such as **sunflower plant** The flower is unisexual, such as **maize plant.**

Methods of mixed pollination:

1. **Pollination by air (wind)**
2. **Pollination by insects**
3. **Artificial pollination**
4. **Pollination by air:**

Stigmas: they are feathery like and sticky → to catch pollen grains from air.

Anthers: they are hanged → to be easily opened by air.

Pollen grains: they are produced by huge number → to compensate what are lost in air.

Pollination by insects:

Petal: it is colored and scented → to attract insects feed on its nectar.

Pollen grain: it is sticky or having coarse surface → to stick on the insect body.

Artificial pollination:

This method of pollination is carried out by man.

For example: the gardener in pollination process of palm trees

Fertilization:

Stage (1)→ After pollination the pollen grain sticks on the stigmas which secretes sugary solution.

Stage (2)→ the pollen grain germinates forming a pollen tube.

Stage (3)→ the pollen tube extends through the style till it reaches the ovule inside the ovary through the micropyle.

Stage (4)→ the end of the pollen tube degenerates and one of 2 male nuclei fuses with the ovum forming a fertilized ovum which is known as "zygote".

Fertilization in plants:

It is the process of fusion of the nucleus of the male cell with the nucleus of the female cell to form the zygote.

Zygote:

the cell resulting from the fusion of a pollen grain and an ovum nuclei.

Formation of seeds and fruits:

After completion of fertilization process:

The wall of the ovary: it develops to becoms the outer coat of the fruit which is called "pericarp"

The wall of the ovule: it develops to become the seed coat.

The ovary: it develops to become a fruit.

The ovule: it develops to become a seed.

Second: Asexual reproduction in plants:

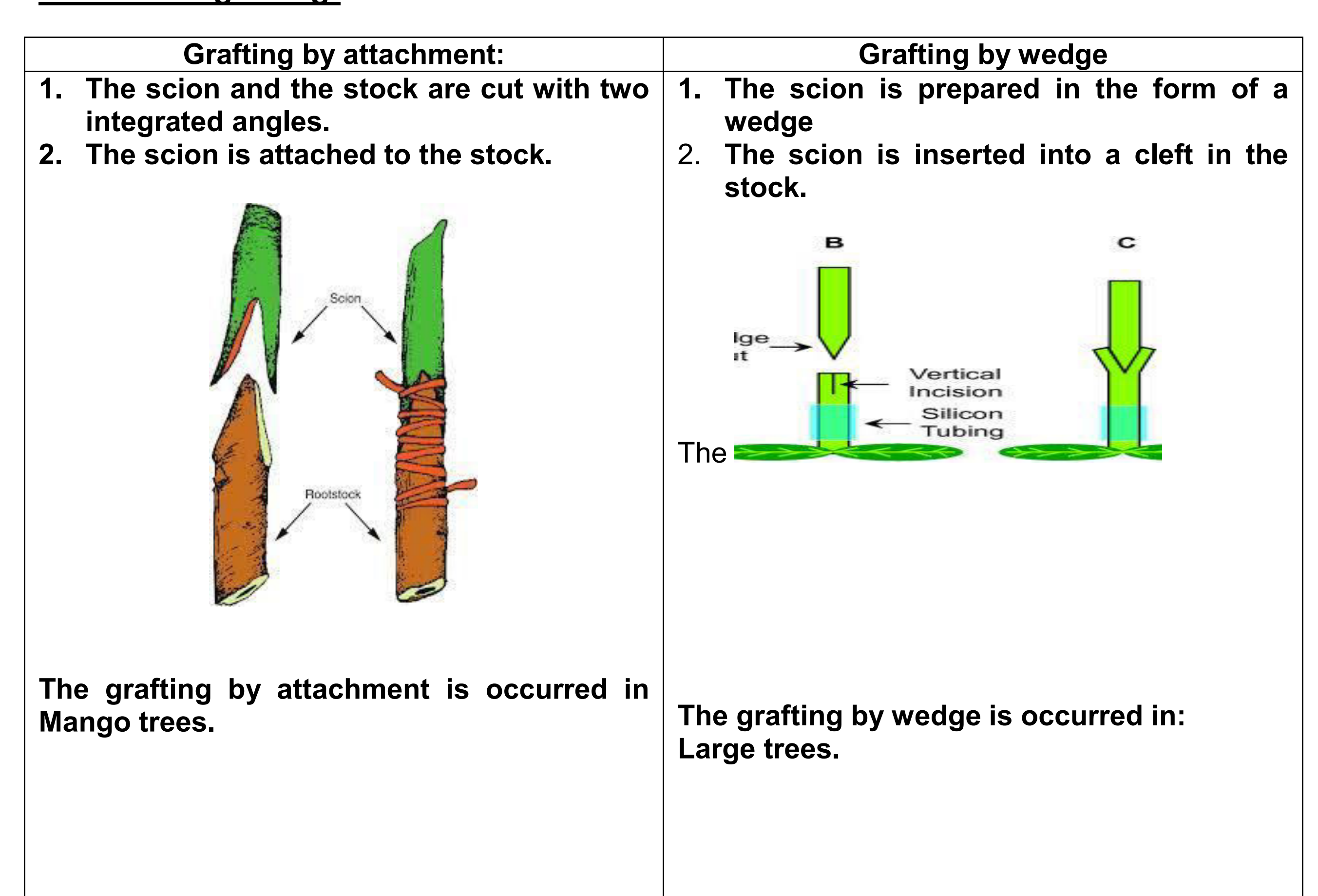
Vegetative reproduction:

It is a process of producing new individuals from different parts of the plant without the flower having a role in this process.

Kinds of reproductive reproduction:

Natural vegetative reproduction:	Artificial vegetative reproduction
Reproduction by tuber **Tuber:** It is a swollen part from a horizontal root or a terrestrial stem, which contains growing buds and it is used for vegetative reproduction. **For example:** A horizontal root as sweet potatoes.	**Reproduction by cutting:** It is a kind of artificial vegetative reproduction in which a part of a plant that contains growing buds known as the cut is planted. **The cut:** It is a part of root, stem or leaf that contains growing buds taken from a plant for reproduction. Examples: Grapes, Roses , sugar cane. **Reproduction by grafting:** It is a kind of artificial vegetative reproduction in which a part of plant which contains more than one bud known as scion is selected to be placed on a branch of another plant known as the stock.

Methods of grafting:

Grafting by attachment:	Grafting by wedge
1. The scion and the stock are cut with two integrated angles. **2. The scion is attached to the stock.**	**1. The scion is prepared in the form of a wedge** 2. **The scion is inserted into a cleft in the stock.**
	The
The grafting by attachment is occurred in Mango trees.	**The grafting by wedge is occurred in:** **Large trees.**

Tissue culture:

It is a process of multiplying a small part of a plant to get many identical parts.

Steps to grow a tissue from the stem of a potato plant:

1. The tissue is separated from the upper part of the stem.
2. The tissue is placed in a nutritive nutrients and hormones.
3. The new plant starts to grow till certain size.
4. The new plant is transferred to the soil to grow normally.

Revision on lesson one

1) write the scientific term:

1. The female reproductive organ of the flower ( )
2. The innermost whorl of a male flower. ( )
3. Minute cells formed inside the flower's anther ( )

2) choose the correct answer:

1. The male flower consists of……………….. whorls

a. 2 b. 3 c. 4 d. 5

2. The ovary of a flower consists……………

a. pollen grains b. anthers c. stigmas d.ovules

3. After fertilization, the ovary develops and becomes the……………

a. fruit b. seed c. flower d. embryo

3) complete the following:

1. .... in plants takes place in two successive processes which are pollination………… then …………….
2. …………… fruit has a single seed, while…………….. fruit has many seeds.
3. Artificial pollination is carried out by………… Such as in……………………..

4) Give reason for:

1. Pollen grains of wind pollinated flowers are produced in a huge number.

…………………………………………………………………………………………………….

2. Pollen grains of insects pollinated flowers are sticky or with coarse surfaces.

…………………………………………………………………………………………………….

What happens when…?

1. A pollen grains falls on a flower's stigma.

……………………………………………………………………………………………

2. Pollen grains become mature (related to the anther)

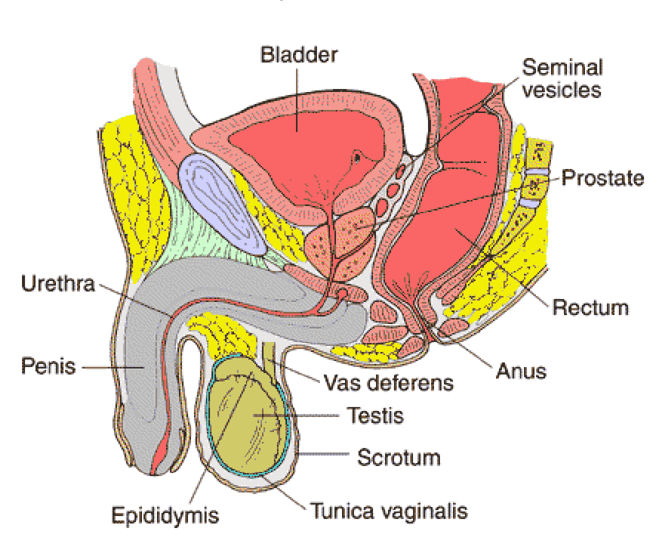
…………………………………………………………………………………………..

Lesson two: Reproduction in humans

Man can't reproduce asexually but he only reproduces sexually Because the individuals coming from asexual reproduction are identical to the parent, while in human, each individual differs from others.

The male reproductive system:





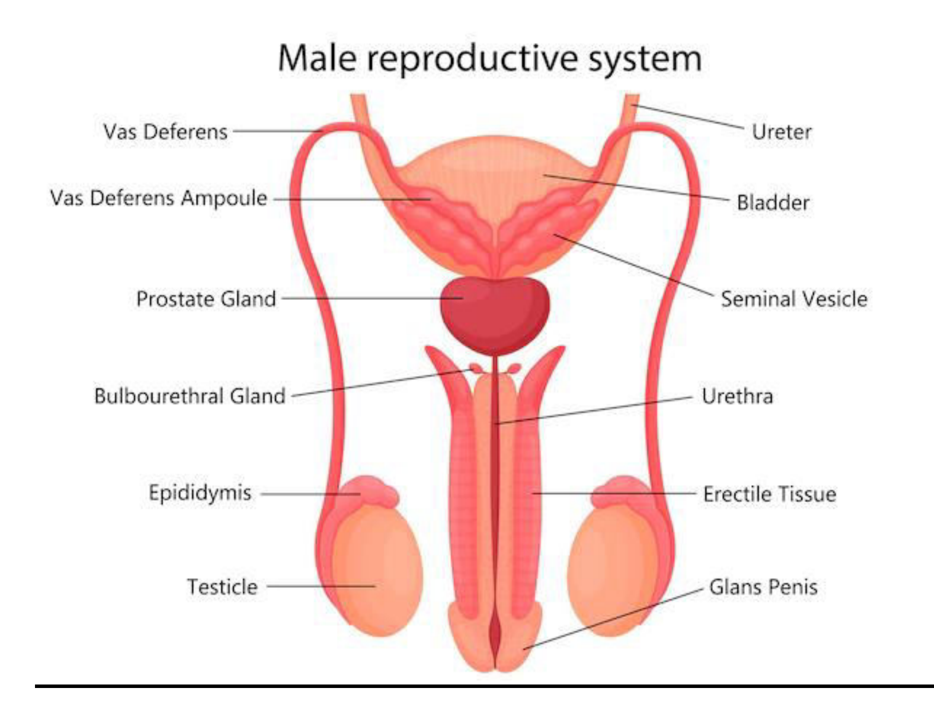
Two testes	The vas deferens	Genital associated glands	The penis
• They are two glands of oval shape • They locate outside the body in a sac like structure called **scrotal sac** which is hanged between male's things. **Function of two tests:** • Production of sperms • Production of male sex hormone known as "testosterone" which is responsible for the appearance of secondary male sex characters **Function of scrotal sac.** • It regulates keeps the temperature of	• Each tests is connected to a group of fine convoluted tubes known as "Epididymis" which extends in the form of a single tube known as "Vas deference" **Function of epididymis:** • The final stages of the growth and development of sperms take place in it. • It stores the sperms. **Function of vas deference:** • It transfers the sperms from the tests to the urinary genital duct urethra)	• There are three kinds of genital glands connected to the male reproductive system, which are: 1. Two seminal vesicles 2. Prostate gland 3. Two Cowper's glands. **Function of genital glands:** They pour secretions on the sperms to form an alkaline fluid known as **seminal fluid.** **Function of seminal fluid :** 1. Nourishes the sperms 2. Facilitate the acidity of urethra.	• It is a sponge- like tissue, the urethra passes through it and in a urinary genital opening. **Functions:** Through which the semen and urine out of the body through the urogenital opening but never at the time.

testes 2℃ below the normal body temperature which is the optimum temperature for the growth and development of sperms.			

Signs of puberty in male:

1. **Growth of hair in certain body areas**
2. **Harshness of voice**
3. **Growth and development of genital organs**
4. **Growth of bones**
5. **Enlargement of muscles.**

The female reproductive system:



Signs of puberty in female:

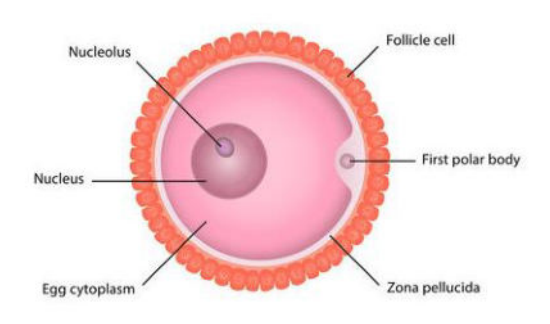
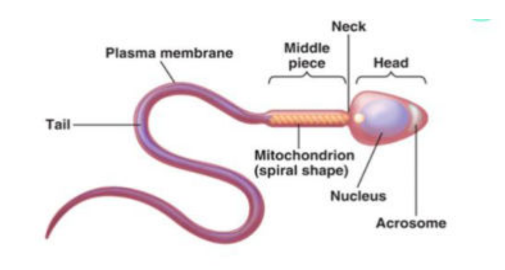
1. **Growth of hair in armpit and pubic.**
2. **Softness of voice.**
3. **Growth and development of breasts.**
4. **Accumulation of fats in some body regions.**
5. **Occurrence of menstrual cycle.**

Menstrual cycle:

1. **It is one of the signs of puberty in female.**
2. **It repeats every 28days, as long as no pregnancy happens.**
3. **It stats at the age of female puberty (11 to 14yeaars) and stops at the age of menopause (45 to 55years)**

Two ovaries	Two fallopian tubes	the uterus	The vagina
• They are two glands having the size and shape of a peeled almond • They locate inside the body in the lower part of the abdominal cavity from the back. **Function:** **1.** Production of ova in a process known as **ovulation** 2. Production of female sex hormones , which are: Progesterone: which is responsible fore the continuity of pregnancy. Estrogen: which is responsible for the appearance of secondary female sex characters.	• They are two tubes of funnel- shaped opening provided with finger- like projections. • The inner wall of fallopian tubes lined with cilia. • The two fallopian tubes are located at the upper corners of the uterus. • They receive the ripe ovum and direct it towards the uterus with the aid of: The contraction and relaxation of the muscles in the tube wall. The movement of the lining cilia.	• It is a hollow pear – shaped organ • It has a muscular wall that can expand as the fetus grows during pregnancy. • It is lined with mucus membrane rich in blood capillaries to form **placenta** during the pregnancy. • It locates in the pelvic cavity between the urinary bladder and the rectum. **Function:** • It protects the fetus unit birth. • It nourishes the fetus during the pregnancy by the **placenta** through **umbilical cord.**	• It is a muscular tube that expands during labour. • it extends from the uterus and ends in the external genital opening **function:** it expands during the labour to deliver (coming out) the baby.

The structure of ovum and the sperm in human:

The ovum (female gamete):	The sperm (male gamete):
• It is relatively large in size **Due to the storage of nutrients materials** • It is not a mobile cell • It is a spherical cell 	• It is considered very small if it is compared with the ovum. • It is a mobile cell 
1. The nucleus: that contains one half of the genetic materials(23chromosome) 2. The cytoplasm: that contains stored food nutrients that are surrounded by plasma membrane. 3. **The cellular membrane:** an insect membrane that surrounds the cell from	**1. The head:** that contains one half of the genetic material (23chromosome) **2. The midpiece:** that contains mitoconderia which are responsible for energy production needed for the sperms movement. **3. The tail:** thin and long and it is responsible

outside.	for the movement of the sperms till reaches the ovum.

Fertilization and embryo formation in human:

1. **The female produces only one ripe ovum on the 14th day of the beginning of menstrual cycle.**
2. **During mating, the male secrets billions of sperms, which move from the vagina towards the uterus then to the fallopian tube.**
3. **The sperms rush the ovum at the beginning of fallopian tube.**
4. **The head of the spam secretes enzymes**

   One sperm only can penetrate the cellular membrane of the ovum.

5. **After the penetration of the sperm, the ovum surrounds itself with a membrane that prevents the penetration of any other sperm.**
6. **Fertilization occurs by the fusion of the nucleus of sperm (which contains 23 chromosomes) with the nucleus of the ovum (which contains 23 chromosomes) to form the zygote, That contains a nucleus with 46 chromosomes.**
7. **The zygote transfers to the uterus to be implanted in its lining**
8. **The zygote divides into many successive divisions into many cells that differentiate and continue to grow forming the empryo.**

Fertilization in human:

It is fusion of the nucleus of male gamete with the nucleus of female gamete to form the zygote.

The pregnancy period:

It is the period between the fertilization process and delivery which extends for about 9months.

Genital system diseases:

First type	Second type
Diseasees don't arises from sexual contact with a sick person or a carrier of a sexually transmitted disease. **Examples:** Uterine cancer, prostate and puerperal sepsis.	Diseases arise from asexual contact with a stick person or a carrier of a sexually transmitted disease. **Example:** Gonorrhea , syphilis and AIDS

Incubation period of the disease:

It is the period between the beginning of infection and the appearance of symptoms of the disease.

Puerperal sepsis (fever)	syphilis
The microbe that causes the disease: Spherical – shaped bacteria. **Methods of infection:** 1. By droplets from a person infected with bacteria and suffering from throat infection or tonsillitis to a vagina of recently labored	**The microbe that causes the disease:** Spiral – shaped bacteria. **Methods of infection:** 1. Sexual contact with an infected person. 2. From a pregnant woman to her fetus

mother 2. An infected wound during the labour. **Incubation period:** From one to four days **Symptoms:** 1. High elevation in body temperature 2. Chills 3. Pallor 4. Severe acute pain in lower abdomen 5. Bad smelling secretions from the uterus. **Means of protection:** 1. Sterilizing the surgical tools during labour 2. Wearing masks during labour 3. Preventing visits of persons, who suffer from respiratory disease to the mother after delivery. 4. The mother should be kept warm and avoid exposure to cold air currents.	**Incubation period:** From two to three weeks. **Symptoms:** 1. Appearance of painless hard ulcer on the head of penis and in vaina and the upper part of cervix 2. Appearance of dark brass coloured rashes on the back and hands of the patient. **Means of protection:** 1. Preventing the sexual contact with an infected person 2. Induce abortion of the infected pregnant woman.

<u>The effect of smoking and addiction on the genital system:</u>

In males: Decreases the formation of female sex hormone.

In female:

- Decrease the formation of female sex hormones.
- Leads to the increase in deformation rete in the embryos.
- Leads to the death of the embryos and newly born babies.

Revision on lesson 2

1) complete the following:

1. Each testis is connected to a group of fine convoluted tubes called …………….. which extends in the form if a single tube known as …………..
2. Testes produce ………….. hormone which is responsible for the appearance of
3. The two testes locate……………….. the body in a structure called………

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2) write the scientific term:

1. An oval – shaped gland that produced male cells ( )
2. A part of male reproductive system that transfers the sperms from testes to urinogenital duct. ( )
3. The period between fertilization process and delivery ( )

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3) choose the correct answer:

1. The right ovary in the female human products a mature ovum every………….. days.

a.24 b.28 c. 34 d. 56

2. Fertilization occurs when…………. Is formed.

a. embryo b. zygote c. endometrium d. ovum

3. An ulcer appears at the trip of the penis in males is due to…………

a. syphilis b. gonorrhea c. puerperal sepsis d. german measles

Give reason for:

1. Man can't reproduce asexually

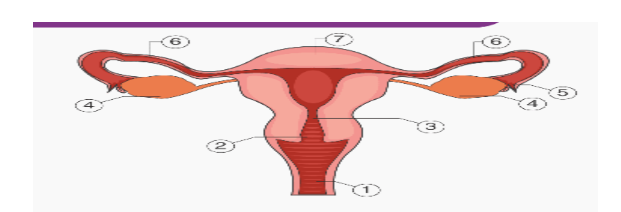
………………………………………………………………………………………………………

2. The man, whose testicles are still present inside the abdominal cavity is infertile.

……………………………………………………………………………………………………..

Study the opposite figure which represents the female genital system, then answer the following questions:

1. Replace the numbers present in the figure with suitable labels.
2. What the organ in which
   a. Ova produced?
   b. the ovum is fertilized?
   c. the embryo is delivered to life?



Revision on unit three

1) put true or false:

1. Stigma is the male reproductive organ in the flower. ( )
2. Reproduction by tubers can be used in apples and pears ( )
3. The pollen grains of the air pollinated flowers are sticky and have coarse surface. ( )
4. The age of menopause in female ranges between 11 to14 years. ( )

2) Complete the following:

1. After ………….., the wall of the ovary develops forming the…………
2. The appearance of an …………….. at the tip of the penis in male is due to syphilis infection
3. Types ovum consists of …………… , ……………. And ……………..

3)write the scientific term:

1. A short stem whose leaves are modified to achieve reproduction in plant. ( )
2. The fusion of one of the male nuclei with the ovum. ( )
3. A new method to large numbers of plants from small parts of it. ( )

4) what will happen when pollen grains mature and become well developed?

……
……

4) Give reason for?

The petal of corolla are coloured and scented.

……
……

5) the opposite figure represents a sperm Answer the following questions:

1. Label the numbers:

1/…………….   2/……………

3/……………..

2. What is the function of number 3?